Soil and Water Resources Components of

"Conservation Agriculture Production Systems for Food Security in Cambodia and the Philippines"

USAID-SANREM-CRSP Project

"Cambodian sub-component"

Annual Report

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I. Executive Summary

This report briefly introduces the research and development activities implemented in this first year of operations by the Cambodian team of the SANREM-CRSP.

The PADAC team and its local SANREM partners, the NGO AVSF-CICDA (Agronomes et Vétérinaires sans frontière) and the faculty of agronomy of the Royal University of Agriculture have mainly implemented the following actions in the 2 chosen villages of Rattanak Mundul district (Battambang province, west Cambodia):

- Initiation of pilot farm extension network for DMC adoption (36 ha with 25 families) combined with farmers organization development
- Implementation of the double (DMC vs Plow) plots sub-sample for soil's parameter evolution with T0 soil sampling
- Farming systems characterization through a 6 months surveys carried out by 2 master students, supported by CIRAD scientists; requested database for the coming implementation of a Reference Farm Network
- Several fields visit to introduce DMC to local farmers (progressive extension of the network) and other stakeholders.

II. Research Strategy and Development Objectives

The Cambodian component of the SANREM-CRSP project aims at assess sustainability of new conservation agriculture based cropping systems for annual cash crops production (Maize dominant) as alternative to the traditional practices based on soil tillage (disc plowing).

This validation process of new technology, compared to local reference, has to deal with 2 kinds of parameters,

- "agro-technical" ones: yields and impact on Soil Organic Carbon (SOC)
- "socio-economic" ones: economic performances of the cropping system (plot level), consequences on production systems, feasibility of organizational arrangements for requested production factor (specific input like cover crop seeds, credit, mechanization, …) access.

These studies rely on a 200 ha-150 households on-farm pilot extension experience (even if technology proposals are feed by upstream controlled and half-controlled experimentations and demonstrations), support of a double monitoring network,

- at plots level: 15 plots under DMC[1] and 15 plots under conventional tillage management
- at farm level: 15 farms adopting DMC and 15 farms continuing plow based management

The SANREM-CRSP project will allow to extend in two villages, Boribo and Pechchangva, Commune of Sdao, District of Rattanak Mondul (Battambang province) research and development approach implemented by PADAC[2] project on larger scale in Kampong Cham province

[1] Direct sowing Mulch based Cropping system, a specific "sub-type" of the broad family of Conservation Agriculture technologies

[2] Projet d'Appui à la Diversification Agricole du Cambodge (2008-2012) of the General Directorate of Agriculture, Ministry of Agriculture, Forestry and Fisheries (MAFF) – granted by AFD (2,5 mill. Euros)

III. Research Progress by Objective.

<u>Objective 1:</u> Assess soil quality and measure crop yield and biomass from conservation agriculture production systems and compare them with soil quality and crop yield and biomass from conventional plow-based systems in Cambodia and the Philippines

Critical Research Accomplishments:

- **Identification and selection of farm demonstration (researcher-managed) and on-farm experimental (farmer-managed) sites**

The DMC subsample of 15 farms has been randomly chosen among farm households decided to adopt new DMC on part of their land. The other subsample of 15 one-ha from the surrounding plow-based practicing farms from 15 households has also been chosen as well, for a total of 30 farms. Within each of these 30 reference plots, 4 'permanent' sampling spots of 50 m² (5 m x 10 m) were randomly chosen and marked with corner stones.

<u>Photo 1.</u> sampling spot in a reference plot

After the next Maize harvest (November 2010), these plots will specifically quoted in the GIS system developed by the project and the center of the rectangle sampling spots will be also marked.

<u>Table I.</u> List of farmers name, owner of the reference plots network

Plot	Practice	Owner
1	DMC	Kong Nga
2	non-DMC	
3	DMC	Maing Kosal
4	non-DMC	
5	DMC	Kuch Socheat
6	non-DMC	
7	non-DMC	Bun Thany
8	DMC	
9	non-DMC	Kuch Socheat
10	non-DMC	Vibol Vannak
11	DMC	
12	DMC	Mork Rith
13	DMC	Chao Sambath

14	DMC	Mork Phan
15	non-DMC	
16	non-DMC	Ven Soch
17	DMC	
18	non-DMC	
19	non-DMC	Tom Thy
20	DMC	
21	non-DMC	Hul Sokhal
22	DMC	
23	non-DMC	Nurn Phem
24	DMC	
25	non-DMC	Hem Kai
26	DMC	
27	non-DMC	Kao Nab
28	DMC	
29	non-DMC	Heng Sokha
30	DMC	

- **Sampling**

Due to late initiation of the fields activities (funds release, conviction and agreement for participation of farmers), It has not been possible to take soil samples on the all 120 sampling spots, prior to the soil preparation and fertilizers application.

The initial soil sampling was done from 15 to 26 March 2010.

The bulk density has been measured as follow (Kubota and al., 2009):

1) Weigh each cylinder with its 2 caps (= 1 sampler). By weighing twice, confirm the weight in the laboratory.
2) In field survey, on the horizontally flat soil surface of each soil layer, put the cylinder with sharpened edge of the cylinder to the soil surface.
3) Push the cylinder using a small shovel and another cylinder or using supplemental soil sampler until the top of the sampling cylinder is beneath the soil surface.
4) Dig out the cylinder along with the surrounding soil, using a small shovel and inserting its edge about 1 cm below of the lower edge of sampling cylinder.
5) Using a kitchen knife, remove the soil surrounding the cylinder gradually, to make the soil surface flat, and even with the edge of the cylinder. If soil is removed below the edge of the cylinder, the sample should be taken again.
6) Wipe the cylinder to remove any remaining soil attached to cylinder surface using a clean rag.
7) Put the 2 caps on the cylinder and tape both cylinder and cap to prevent evaporation of water from the cylinder.
8) After finishing the sampling at a soil layer, remove the soil from the finished layer, making a flat surface at the next soil layer.
9) Repeat soil sampling procedure 2) to 8).
10) After soil sampling, refill the soil pit with soil that was removed.
11) Take the soil samplers to the laboratory, weigh the full soil samplers (cylinder and 2 caps) after removing the tape. By weighing twice, confirm the weight.
12) Remove the top cap from the cylinder carefully so as not to spill the soil, and put the removed cap under the cylinder with the bottom cap still attached. Then put the samplers (each consisting of cylinder + 2 caps + wet soil) into the drying oven. Dry them at 105 °C for more than 2 days.
13) After more than 2 days, take the soil samplers from the drying oven, cool them down, and weigh them. By weighing twice, confirm the weight.

Calculation

$$da=Wd/v=(Wdt-T)/v$$

where: da = Bulk density
Wd = Dried weight of the soil in the sampler
v = Volume of the sampler
Wdt = Dried weight including sampler
T = Weight of sampler (a cylinder and 2 caps)

cf. results in **appendix 1**.

- **Establishment of first cropping in both researcher-managed and farmer-managed sites**

Research managed demonstration plots

In Parallel of SANREM-CRSP pilot extension process, PADAC is renting and directly managing 2 plots; the first (2,0 ha) has been initiated in 2009 (2nd cropping season under DMC management) and the 2nd (1,5 ha) came to complete technologies proposal in 2010.

These plots, implemented in Boribo village, on land considered as degraded by farmers (high weeds pressure, Maize yields below 3 t/ha), aim at:

- set up the cropping systems (crops successions, technical management) in the specific context of Rattanak Mondul (slight adaptation / systems developed in Kampong Cham province),
- provide a first technical and economic assessment of the cropping systems' performances,
- create demonstration sites for farmers at significant scale (similar size to farmers' plots) of a large technical possibilities.

Figure n°1. DMC based crops succession implemented on the 1st demonstration plot.

	2009			*2010*		
	Plot	F1	F2	Plot	F1	F2
Maize // Soybean rotation	1a	B. pump Millet / Maize + Brach r.		1a	Brach r. / Soybean + Sorghum + Stylo g.	
	Var. CP 888	4 065	5 070	Var. CP 888		
	1b	B. pump Millet / Soybean + Stylo g.		1b	B. pump Millet / Maize + Stylo g.	
	Var. Asca	2 045	2 200	Var. Asca		
Maize monocropping	2	B. pump Millet / Maize + Stylo g.		2	Stylo g. / Maize + Stylo g.	
	Var. CP 888	3 575	5 565	Var. CP 888		
Maize // Cassava rotation	3a	B. pump Millet / Maize + Stylo g.		3a	Cassava + Stylo g.	
	Var. CP 888	4 060	5 350	Var. CP 888		
	3b	Cassava + Stylo g.		3b	B. pump Millet / Maize + Stylo g.	
	Var. local	13 020	13 290	Var. local		
Cassava monocropping	4	Cassava + Stylo g.		4	Cassava + Stylo g.	
	Var. local	11 750	13 525	Var. local		

Yields of Maize, Soybean (kg/ha dried grains, 14% moisture)
Yields of Cassava (kg/ha peeled and dried tubers)

B. pump Millet = 60-70 days biomass production of Pearl Millet (Pennisetum typhoides), Brach r.= Brachiaria ruziziensis, Stylo g. = Stylosanthes guianensis,

F1 – low/ medium level of fertilizers application;
in 2009, 69-35-30 on Maize, 69-35-60 on Cassava, 23-35-60 on Soybean
F2 – medium/ high level of fertilizers application;
in 2009, 115-85-60 on Maize, 92-85-90 on Cassava, 23-85-90 on Soybean

Photo n°2. Demonstration plot n°1, Soybean on Brachiaria ruziziensis cover
(2nd year after DMC conversion)

Comments on evolution 2009 - 2010

On Maize // Soybean rotation

(1) abandon of the grass Brachiaria r. as cover crops implemented in association with corn due to significant impact on Maize production (observed in Kampong Cham province experimentation system)
(2) introduction of Sorghum as secondary crops in association with soybean (seeds are broadcasted with Stylosanthes g. in the Soybean at the beginning of the defoliation)

Globally, observation of a poor development of the Stylosanthes g. (adapted to acidic soil) in this soil with presence of "active" limestone (presence of karstic hills in the landscape).

Figure n°2. DMC based crops succession implemented on the 2nd demonstration plot.

2010

	Plot	F1	F2
Maize monocropping + Rice bean as secondary crop	1	B. pump Millet / Maize + Stylo g. + V. umbellata	
	Var. CP 888		
Maize monocropping + Pigeon pea as secondary crop	2	B. pump Millet / Maize + Stylo g. + C. cajan	
	Var. Asca		
Maize // Rice rotation + Rice bean and Cowpea as secondary crop	3a	B. pump Millet / Maize + Stylo g. + V. umbellata	
	Var. CP 888		
	3b	B. pump Millet / Rice sc + Stylo g. / V. unguiculata	
	Var. CP 888		
Soybean monocropping + Sorghum as secondary crop	4	B. pump Millet / Soybean + Sorghum + Stylo g.	
	Var. local		

V. umbellata = Vigna u. (Rice bean), C. cajan = Cajanaus c. (Pigeon Pea), V. unguiculata = Vigna u. (Cowpea), Rice sc = upland Rice short cycle varieties (90 to 105 days)

Photo n°3. Demonstration plot n°2, upland rice short cycle on Pearl Millet cover
(1st year of DMC practices)

Comments

This 2nd demonstration will allow to test:

(1) new associations with Maize in order to try to combined legumes based biomass production with secondary grains production (introduction of Vigna umbellata or Cajanus cajan); in these systems, Stylosanthes g. is now sown on the row of Maize, while the secondary grain legumes is implemented in the middle of the Maize interrow (0,8 m), about 15 days after sowing.

(2) Crops rotation between Maize and upland rice (targeting extension on small-medium farms which do not hold rainfed lowland rice fields ; self consumption goal first)

(3) Monocropping of Soybean with Sorghum as secondary crops (already efficient system in Kampong Cham experimental system)

Soybean and upland Rice will be harvested by end of October, Maize around mid November and Cassava in January-February 2011.

On-farm pilot extension network

The pilot extension objective in this 1st year of operation has been fixed at 50 ha with about 40-50 families in order to reach 200 ha with about 150 families in 2011.

Due to delayed funds arrival (late identification of the technicians, too late arrival of machinery, especially specific no-till planter for DMC, imported from Brazil), the pilot network is only covering 33 ha with 26 families in 2010. This “downsizing” has allowed to implement a good monitoring of farmers plots by SANREM-CRSP technicians (AVSF subcontract) closely supported and trained by more experienced PADAC staff leading to promising results (harvest by mid November) and quite positive perception by farmers of the technology and support methodology proposed by the project.

Table II. List of farmers involved in Pilot extension network

Plot n°	Name	Sex	Village	Soil Type	Cropping System	Plot surface (ha)	Year of DMC
1	M. Hèm Kay	M	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	2,12	1
2	Mme. Hul Sokhâl	F	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,10	1
3	Mme. Chear Phâl	F	Boribo	Black	Stylo g. 2009 / Maize + Stylo. g.	1,01	2
4	M. Chear Chhearn	M	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	5,00	1
5	Mme. Nourn Phoem	F	Boribo	Black	Stylo g. 2009 / Maize + Stylo. g.	0,50	1
6	Mme. Tom Thy	F	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	0,77	1
7	M. Hul Sorn	M	Boribo	Black	Stylo g. 2009 / Maize + Stylo. g.	0,70	2
8	M. Choem Chhorn	M	Boribo	Black	Bio-p. Sorghum + Stylo. 2009/Maize + Stylo.	1,20	2
9	M. Kao Nap	M	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,08	1
10	M. Kèn Lâm	M	Boribo	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,70	1
11	Mme. Hul Sokha	F	Boribo	Black	Stylo g. 2009 / Maize + Stylo. g.	0,96	2
12	Mme. Phéng Phearp	F	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	0,57	1
13	M. Kuch Sokchear	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	0,56	1
14	Mme. Mâk Rith	F	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,00	1
15	M. Vibol Vannak	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,00	1
16	Mme. Bun Thany	F	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	2,53	1
17	M. Mâk Phan	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,13	1
18	M. Chao Sambath	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,00	1
19	M. Mearng Kosâl	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	0,86	1
20	M. Tuy Phéng	M	Pichangva	Black	Bio-p. Sorghum + Stylo. 2009/Maize + Stylo.	1,02	2
21	M. Kong Nga	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	2,00	1
22	M. Hèm Dân	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,01	1
23	Mme. Phéng Sophat	F	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	0,49	1
24	M. Vèn Soch	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,50	1
25	M. Ngoy Roeurm	M	Pichangva	Black	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,10	1
26	M. Sath Sarâng	M	SângHa	Sandy	Bio-p. Millet or Sorghum / Maize + Stylo. g.	1,10	1
Total		9F 17M				**33,01**	

In order to maintain this good level of performances and implement the network with really convinced farmers, the network should reach only 150 ha only in 2011 (with about 100 families) before to attain its maximum extension in 2012 (200 ha with about 130 families).

The first feed-back provided by farmers (to be more precisely recorded after harvest) insisted on clear impact of DMC on weeds control, partly thanks to the implementation of a short term biomass production ("Bio pump") of Pearl Millet or Sorghum, prior to the Maize sowing in July-August (even if the bio pump growth has been limited this year due to limited rainfalls from April to mid June).

Photos n°4 and 5. Severe erosion on young Maize crop on plow soil (left); good soil protection even with a limited pearl Millet mulch, 3 weeks after rolling and termination by herbicides (right)

Photos n° 6 and 7. Direct seeding of Maize on Pearl Millet cover in farmers' plots; on right, part of the PADAC – SANREM-CRSP technicians team

Development Impact

DMC production of Maize starts to be perceived as a promising alternative to the destructive plow-based cropping systems, as pinpointed in several occasions along discussions with farmers.

The director of the Provincial Department of Agriculture of Pailin, a neighboring province where about 50 000 ha have been converted from forest to upland cultivation (Maize and Cassava) since early 2000's, told us during a project's visit in September 2010, that about 10 to 15% of the reclaimed land have been already abandoned due to crops productivity drops. He clearly stated that the proposed DMC technologies by PADAC and SANREM-CRSP are up to now the only "realistic" way to reverse current "mining" dynamics. These views were also shared by several

local private companies involved in Maize production and processing also invited to visit SANREM-CRSP farms network.

Challenges and Responses

Such a pilot network is primarily built to prepare the up-scaling of the new technologies extension. In this prospective, it allows to raise and order challenges and to conceive and test proposals to address them.

Classically, these challenges are related to training and productions factors access.

Training system

In late September 2010, PADAC has received the support of Mr. Andre Chabanne (andre.chabanne@cirad.fr), researcher of CIRAD-PERSYST who came, within a regional mission (Vietnam and Cambodia, supported by CANSEA, the Conservation Agriculture Network for South East Asia), to plan the elaboration of a training system for engineers, technicians and farmers. For Cambodia, it has been asked to him to design such a plan for a still potential pilot development project aiming at extend DMC on 5 000 ha within 4-5 years (about 3 000 farmers, 60 fields technicians).

Various kinds of training supports will be progressively prepared by PADAC and CIRAD. Some of them could be based on the technical textbooks ("unfortunately" in French) progressively released by CIRAD on the experience of DMC development in Madagascar (olivier.husson@cirad.fr).

As already discussed with the SANREM-CRSP project coordinator, Mr. Manuel R. Reyes, closed collaborations are requested on this issue to optimize time and resources in training documents' preparation and edition.

Production factors access

As PADAC initiated it in 2008-2009 in Kampong Cham Province, SANREM-CRSP targets to ease the access to requested production factors, needed to properly implement at farm level DMC cropping systems, through the progressive development of contract farming.

This approach requests a parallel operation to organize farmers, involved in DMC adoption, first in small groups, future basic units of larger organizations; this work is implemented by AVSF (sub-contract) – cf. monthly reports in attachments. It benefits from the pre-existing CBO, community Based Organization which regroups already almost 500 members.

This CBO consist of 512 members who based in 2 communes, 8 villages:

- Nowadays they are going with three activities: saving and credit, Rice bank, and cow bank
- Capital: Credit 74.860.600 KhR (# 17 500 US$), Rice bank 6 246Kg, Cow bank 170 heads

Target village of SANREM project:

1.Sub-group in Boribo

- 75 families are member of CBO among 164 families of total number

- 11 families are adopting DMC technique among which 7 members are members of CBO and other four farmers are outside the this existed CBO

2. Sub-group in Pichangva
- 61 families are member of CBO among 172 households of total number
- 15 families are practicing DMC technique that 11 members are CBO's members and other 4 farmers did not join the CBO

Credit and inputs

It is planned to introduce credit access by involving traditional bank system (Micro Finance Institution, proposing to high rates of 3-4% / month, for credit lasting from 10 to 12 months to cover a full cropping season, from input purchase to products' sales). Preliminary contacts have been established with ANZ Bank (Australia and New Zealand Banking Group Limited) during the project design phase; ANZ announced then that it was ready to release a credit (in US $, at 11-12%/year) to an Agro-industry developing production contracts with farmers to pre-finance farmers inputs, within a maximum amount of 30% of the production contract value. Risk on this credit is partly cover by project's fund, with a decreasing coverage, from 30% in first year to 10% in third year before complete transfer to private sector in year 4 and 5.

In 2010, due to late initiation of operation, too limited knowledge of the zone to identify proper industrial partner, too small surface to be really attractive, even for SME and unorganized farmers, inputs (fertilizers, herbicides and seeds) have been purchased with PADAC funds before to be "retailed" to farmers on a free credit basis (0%).

Mechanization

Regarding mechanization access, the project aims to trigger the substitution of the current plowing contractors' by services oriented on DMC implementation: introduction of specific no till planters (from Brazil) and medium sized sprayers (reducing the number of herbicides applicators, in order to properly train them on products uses).

"Advertising" n°1. No Till planter to be introduced in Cambodia (PA 5000, Vence Tudo company) to propose services to farmers

To achieve this goal within project duration, SANREM-CRSP combines two measures:

- introduction of hardy but efficient material in the project area (specific services initially provided by the project); these materials are imported from Brazil (sprayer, planter) at reasonable price (e.g. 3 row Maize planter costs less than 9 000 US $) or locally made (sprayer –only nozzles are imported-, roller, fertilizers spreader);
- mixing within the farms network few larger farmers, with higher investment capacity, besides the dominant small-medium holders.

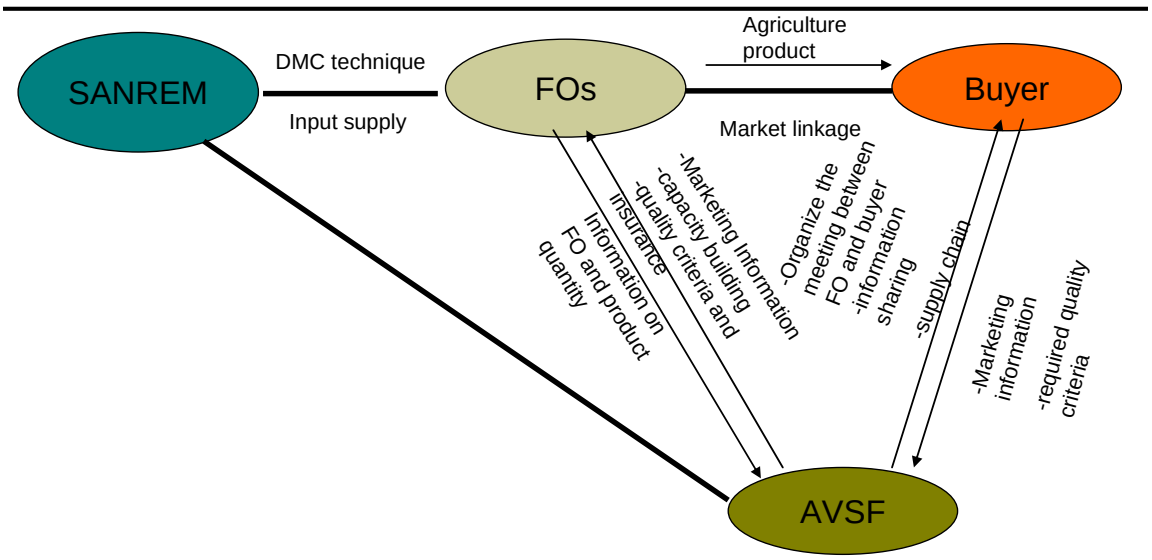

Figure n°3. Organizational chart for a progressive development of Contract farming

***Objective 2:* Identify field- and farm-level CAPS that will minimize smallholder costs and risks while maximizing benefits and adoption in Cambodia.**

See above demonstration plots with increasing diversification and introduction of secondary crops with a double purpose of biomass production strengthening and complementary incomes. These new CAPS proposal must be first evaluated on controlled plots during 2-3 cropping seasons prior to be proposed to farmers having already a correct understanding of DMC techniques.

***Objective 3:* Pinpoint gendered limitations and advantages that can promote adoption of CAPS, and determine if CAPS will increase labor burden on women in Cambodia.**

SANREM-CRSP Cambodian sub-component has received the support mission of Ms. Helen Dayo, gender specialist, in June 2010. Group discussions have been organized with women to try to determine trends in labor sharing between woman and man at farms level.

During the baseline survey (see below), it has appeared that women play an important role in the decision making for household management.

It is also noticeable that most of the leaders of the CBO are women.

Regarding the impact of DMC adoption on the women's labor burden, it is of course too early to conclude; presumptions lead us to think that it may have positive impact because DMC will alleviate labor in task where women are predominantly participating:

- sowing will be mechanized, while often done by hand, after furrowing by power tiller, in the traditional practices
- weeding labor will be reduced by used of herbicides (applied by contractors or men; women never spray in Cambodia)

Photo n°8. Meeting with a Women group during gender specialist support mission

***Objective 4:* To quantify the effectiveness of SANREM supported farmer groups in Cambodia.**

The double group of plots (DMC and plowing) will allow to have clear assessment of the DMC impact at plot level on soil and cropping systems performances (technical and economic).

Impact of DMC adoption will be also assessed at farms level (farming systems) through the monitoring of "reference farms network" (RFN), also split in two sub-groups (DMC and plow-based systems) and representative of the diversity of farms conditions , based on the preliminary establishment of farms typology.

In order to prepare the setting of the RFN, a baseline survey has been implemented by 2 students, preparing here their final thesis of Master of Science:

- Mr Chhoeum Chankakada, Cambodian, from GIDAR Master of the Royal University of Agriculture (Phnom Penh)
- Mr. Bertrand Ricard, French, from Institut des Régions Chaudes (Montpellier).

From April to September 2010, they have conducted about 50 in-depth surveys at farm level and realized a serie of interviews with various stakeholders. The surveyed farms represent about 10 % of the total households and cropped lands of Boribo and Pechchangvar villages.

This work has received, in its initial phase, the support of Mr. Eric Penot CIRAD agro-economist, come in mission from May 15th to 29th, 2010; a mission report (47 pp. + Appendix) has been released and transferred to project coordinator; soft version can be sent, on request.

Summary of the Eric Penot's report

The PADAC project has as general objective to prepare for a large scale diffusion of CA technologies for strictly rainfed areas which constitutes the essence of the "land reserve" of Cambodia. Secondarily, it can sustain various intensification levels and diversification/ alternatives of flooded rice systems beside self-subsistence and pluri-activity (off farm). The SANREM Project schedules an extension on the area of Batambang. The mission aims partially to accompany (methodology) and train the project members and associated students trough the development for a modelling tool allowing a better adequacy between CA technologies and farmers' types. A Farming System Reference Monitoring Network will be implemented in the zone of Battambang as that already developed in 2009 in Kompong Cham. This mission provides technical and methodological support to the surveys to be done: farm characterization in 2 villages (district of Rattanak Mondul, province of Battambang).

During the mission, support has been provided to 2 training courses of students (Cambodian and French) scheduled to implement surveys from March-April to August-September 2010.

A debriefing presentation by students of this baseline survey has been organized at AFD in presence of Mr. TUY Samram of the USAID mission in Phnom Penh, on October 6th, 2010.

IV. Degree and Non-Degree Training Activities

Degree training students supported.

Support of 2 students realizing their final thesis for Ms graduation (see above)

Photo n°9. Two students conducting interview with farmers of Boribo village

Short-term training events conducted

See list of fields visits organized on the projects sites in **Appendix 3**.

In 2010, a total of 99 persons (70 men and 29 women) have visited projects sites, mainly in a view to introduce DMC technologies to local farmers and others key stakeholders. Preparation of the extension of the DMC network in 2011, on voluntary basis.

Photo n°10. Group of farmers during fields visit (September 2010)

V. Publications, Presentations, and Other SANREM CRSP Products

- A simple brochure on the SANREM Conservation Agriculture project was prepared.
- Mission Report of Mr. Eric Penot

  Technical support Mission for the implementation of a Farming System Reference Monitoring Network in the province of Battambang.

  Agrarian diagnosis and identification of a farming systems typology, in order to implement a reference farms network, in Battambang province - Rattanak Mundul district). 47 pp + Appendixes
- Students' final report (under progress)
- AVSF synthetic report on farmers' organization support (under progress)

VI. Networking Activities

Reception of the Philippine and NC A&T scientists, for a fields visit and technical exchanges, from 6th to 12th of June 2010:

- Ms. Helen Dayo, gender specialist
- Mr. Victor Ella, University of the Philippines Los Baños
- Mr. Agustin Mercado, agronomist
- Mr. Manuel R. Reyes, NC A&T, project coordinator
- Mr. Osei A. Yeboah, NC A&T, economist

This trip has been occasion to present the project area, DMC cropping systems principles, experimentation and methodology implemented by CIRAD within PADAC project to NC A&T coordinator and Philippines colleagues.

It gave also the opportunity to transfer a first batch of technical propositions, *a priori*, adapted to Mindanao conditions, introduce specific DMC machinery (planter), to exchange on socio-economic assessment and gender issue.

Photos n°11 and 12. Visiting Demonstration plot n°1 at Boribo village; on right “skinny” pearl Millet cover due to limited rainfalls on April-June

Transfer of material purchased in Brazil (2 row planter Fitarelli, Hand-jab planter).

APPENDIX

1/ Results of Bulk density measurements

2/ ToR of AVSF to arrange meeting between FO and local Agro-industries

3/ Form on achieved non degree training between April and September 2010

- Bulk Density (BD)

Plot	Depth (cm)	BD in sub-plot (g/cm^3)				Mean BD (g/cm^3)
		1	2	3	4	
1	0-5	1.185	1.294	1.172	1.265	1.229
	5-10	1.236	1.234	1.348	1.125	1.236
	10-20	1.094	1.175	1.127	1.173	1.142
	20-30	1.224	1.241	1.249	1.206	1.230
2	0-5	1.346	1.171	0.986	1.079	1.146
	5-10	1.347	1.085	1.196	1.334	1.240
	10-20	1.139	1.069	1.143	1.262	1.153
	20-30	1.159	1.159	1.225	1.258	1.200
3	0-5	1.094	1.139	1.238	1.171	1.161
	5-10	1.315	1.404	1.194	1.136	1.262
	10-20	1.183	1.312	1.172	1.362	1.257
	20-30	1.194	1.348	1.282	1.244	1.267
4	0-5	1.492	1.345	1.426	1.282	1.386
	5-10	1.580	1.689	1.470	1.625	1.591
	10-20	1.393	1.534	1.569	1.481	1.494
	20-30	1.404	1.181	1.603	1.580	1.442
5	0-5	1.187	1.271	1.143	1.192	1.198
	5-10	1.183	1.308	1.442	1.189	1.281
	10-20	1.139	1.218	1.503	1.144	1.251
	20-30	1.128	1.188	1.502	1.280	1.275
6	0-5	1.302	1.216	1.235	1.282	1.259
	5-10	1.174	1.275	1.164	1.323	1.234
	10-20	1.156	1.389	1.202	1.420	1.292
	20-30	1.247	1.477	1.277	1.427	1.357
7	0-5	1.141	1.115	1.194	1.238	1.172
	5-10	1.147	1.068	1.315	1.270	1.200
	10-20	1.091		1.315	1.330	1.245
	20-30	1.160		1.415	1.177	1.251
8	0-5	1.009	1.359	1.205	1.251	1.206
	5-10	1.119	1.348	1.295	1.283	1.261
	10-20	1.116	1.249	1.360	1.282	1.252
	20-30	1.271	1.315	1.365	1.257	1.302
9	0-5	1.315	1.370	1.236	1.422	1.336
	5-10	1.337	1.437	1.215	1.220	1.302
	10-20	1.282	1.382	1.441	1.340	1.361
	20-30	1.404	1.348	1.438	1.299	1.372
10	0-5	1.304	1.492	1.290		1.362
	5-10	1.547	1.492	1.518		1.519
	10-20	1.536	1.437	1.553		1.509
	20-30	1.492	1.415	1.521		1.476
11	0-5	1.036	1.189	1.374	1.441	1.260
	5-10	1.529	1.377	1.413	1.326	1.411
	10-20	1.456	1.343	1.544	1.255	1.400
	20-30	1.633	1.401	1.490	1.560	1.521

12	0-5	1.067	1.320	1.203	1.149	1.185
	5-10	1.307	1.359	1.451	1.116	1.308
	10-20	1.216	1.382	1.237	1.415	1.312
	20-30	1.364	1.512	1.320	1.238	1.358
13	0-5	1.238	1.058	1.116	1.190	1.151
	5-10	1.083	1.173	1.326	1.285	1.217
	10-20	1.061	1.373	1.481	1.288	1.301
	20-30	1.437	1.362	1.470	1.169	1.359
14	0-5	1.238	1.260	1.170	1.028	1.174
	5-10	1.293	1.426	1.422	1.404	1.386
	10-20	1.415	1.437	1.271	1.249	1.343
	20-30	1.437	1.459	1.188	1.227	1.328
15	0-5	1.061	1.061	1.157		1.061
	5-10	1.404	1.205	1.379		1.304
	10-20	1.503	1.205	1.386		1.354
	20-30	1.492				1.492
16	0-5	1.152	1.090	1.101		1.096
	5-10	1.328	1.090	1.219		1.155
	10-20	1.377	1.298	1.161		1.229
	20-30	1.440		1.273		1.273
17	0-5	1.175	1.208	1.163		1.182
	5-10	1.270	1.236	1.255		1.254
	10-20	1.282	1.296	1.268		1.282
	20-30	1.312	1.329	1.300		1.314
18	0-5		1.159		1.069	1.114
	5-10		1.147		1.208	1.178
	10-20		1.105		0.894	1.000
	20-30		1.109		1.056	1.082
19	0-5	1.208	1.230	1.312		1.250
	5-10	1.663	1.327	1.442		1.477
	10-20	1.342	1.482	1.389		1.404
	20-30	1.266	1.432	1.477		1.392
20	0-5	1.346	1.402	1.393	1.164	1.326
	5-10	1.545	1.580	1.347	1.627	1.525
	10-20	1.496	1.500	1.293	1.325	1.403
	20-30	1.433	1.505	1.265	1.424	1.407
21	0-5	1.149		1.086		1.117
	5-10	1.108		0.980		1.044
	10-20	1.224		1.099		1.162
	20-30	1.239		1.235		1.237
22	0-5	1.047		1.158	0.942	1.049
	5-10	1.000		1.126	1.200	1.109
	10-20	1.284		1.218	1.192	1.231
	20-30	1.047		1.287	1.277	1.204
23	0-5	1.402	1.548	1.548		1.499
	5-10	1.324	1.428	1.425		1.392
	10-20	1.449	1.434	1.385		1.422
	20-30	1.477	1.489	1.445		1.470

24	0-5	1.592			1.643	1.617
	5-10	1.392			1.384	1.388
	10-20	1.591			1.460	1.525
	20-30	1.490			1.566	1.528
25	0-5	1.097			1.122	1.109
	5-10	1.465			1.437	1.451
	10-20	1.274			1.282	1.278
	20-30	1.373			1.313	1.343
26	0-5	1.184		1.112	1.194	1.163
	5-10	1.222		1.236	1.113	1.190
	10-20	1.308		1.282		1.295
	20-30	1.277		1.548		1.413
27	0-5	1.090		1.226		1.158
	5-10	1.111		1.214		1.163
	10-20			1.190		1.190
	20-30					
28	0-5	1.212	1.075	1.130	1.198	1.154
	5-10	1.207	1.254	1.060	1.138	1.165
	10-20	1.235		1.284	1.155	1.225
	20-30	1.169			1.417	1.293
29	0-5	1.608	1.361	1.295	1.285	1.387
	5-10	1.263	1.678	1.196	1.453	1.397
	10-20	1.227	1.457	1.347	1.386	1.354
	20-30	1.361	1.358	1.358	1.673	1.438
30	0-5	1.411		1.036	1.195	1.214
	5-10	1.419		1.501	1.377	1.432
	10-20	1.640		1.415	1.522	1.526
	20-30	1.559		1.530	1.530	1.540

Note
SM: Soil Moisture
Not sampled
Depth with gravel

PADAC-SANREM Project – MAFF/DGA/CIRAD/AVSF

Meeting with Farmers Organizations
(02/10/2010)

Terms of Reference

Background

The **PADAC-SANREM** project is implemented through an official partnership between the French government and the Ministry of Agriculture, Forestry and Fisheries of Cambodia (**MAFF**). The main implementing partners are the **GDA** (General Directory for Agriculture of the MAFF) and the French agricultural research organisation **CIRAD**. The French NGO **AVSF** contributes to support Farmers' Organisations (FO) on structuring and marketing, based on 20 years of intervention in the country.

Financed by both **AFD** (French Development Agency), which is the bi-lateral development finance institution that works on behalf of the France's Overseas Development Assistance policies, and **USAID**, which is the American counter-part of AFD, this project aims to strengthen and modernize Cambodian agriculture, first, in two pilot provinces (Kampong Cham and Battambang) and later on overall the country. In this regard, successful contract farming is a key factor, mainly depending on adoption of innovative techniques (DMC) and proper FO management to ensure an adequate supply (quantity, quality and regularity).
In a first stage, the contract farming could be based on a tripartite partnership "FO – agro industries – banking system (ANZ)", at a pilot scale (around 200 ha, corresponding to around 1,000 tons of raw products).

Objectives

- Mutual knowledge between agro industries and FO involved in the project
- Show to the agro industries representatives the applied innovative production technique (DMC)
- Explore the potential supply from the FO to the agro industries

Location

Boribo village, Sdav commune, Rattanakmondol district, Battambang province.

Participants

- KOGID: Mr. Chheang Chann (to be confirmed), Mr. Nam Seung Woo?
- Mithapheap Pailin and City Agrotech representatives
- CIRAD: Mr. Sar Veng, Mr. Phalla Kang
- AVSF staff: Mr. Cedric Martin, Mr. Yeng Nou, Mr. Senghorng Tuot
- FO representatives:
    - DMC samaki rok tiphasa: Mrs. Pheng Pheap, Mr. Chum Mai
    - Keilum or dey ning tiphasa pum boribo: Mr. Chin Chum, Mrs. Hul Sokhal, Mrs Prum Oun

Expected outputs:

- Meeting report specifying supply potential
- Draft of tripartite partnership contract "FO – agro industries – banking system (ANZ)"

Tentative Program

Time	Subject	Location
9:00-9:30 am	Discussion: - Self introduction of the participants - Presentation of the meeting objective and project - Presentation of the FO activities in the project	PADAC's office at Sdav commune
9:30-10:00 am	Trip to demonstration plots	Sdav-Boribo
10:00-10:40 am	Commented visit of the demonstration plots	Boribo village
10:40-11:00 am	Commented visit of the farmers plots	
11:00-11:30 am	Debriefing: - Discussion on the supply potential - Summary and conclusion of the meeting	

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Non-degree Training SANREM CRSP Activity: _____

Program type **(workshop, seminar, field day, short course, etc.)**	**Date**	**Audience**	**Number of Participants**		**Training Provider** **(US university, host country institution, etc.)**	**Training Objective**
			Men	**Women**		
Field day	August 8, 2009	Farmers, officers of the Provincial Department of Agriculture of Battambang and Pailin Province	18	11	PADAC staff	Introduction to DMC technologies
Short course	September 22-24, 2010	Farmers members of Farmers Organization developed by the project	12	5	AVSF	Training session on FO management and basic concept of Marketing
Field day	September 22, 2010	Farmers, officers of the Provincial Department of Agriculture of Battambang and Pailin Province	13	11	PADAC, SANREM (AVSF sub-contract) staff	Introduction to DMC technologies
Field day	September 23, 2010	Farmers	19	5	PADAC, SANREM (AVSF sub-contract) staff	Introduction to DMC technologies
Field day	September 29, 2010	Farmers	17	5	PADAC, SANREM (AVSF sub-contract) staff	Introduction to DMC technologies
Field day	September 30, 2010	Farmers	17	5	PADAC, SANREM (AVSF sub-contract) staff	Introduction to DMC technologies
Field day	October 02, 2010	Farmers organization (marketing responsible) and representative of 2 local Agro-industries	4	3	PADAC, SANREM (AVSF sub-contract) staff	Introduction to DMC technologies, first contact between FO and potential Maize buyers for 2010's harvest